High Performance Asphalt Intersections – Fact or Fiction?

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Presentation Overview

- Intersection Design Considerations
- New Pavements
- Existing Pavements
- Examples of High Performance Intersections

Intersection Considerations

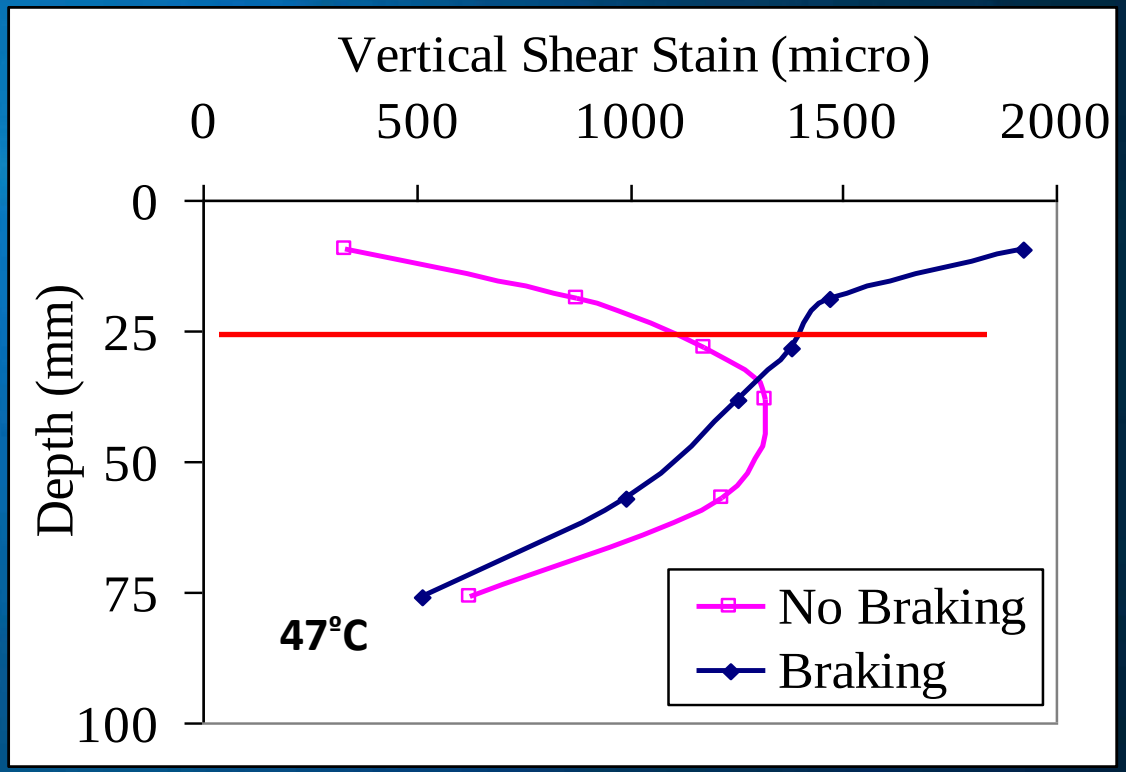
- Slow moving, heavy trucks

Intersection Considerations

- Select appropriate materials

Intersection Considerations

- Braking Forces
  - Impact of Truck Loading and Braking on Flexible Pavements

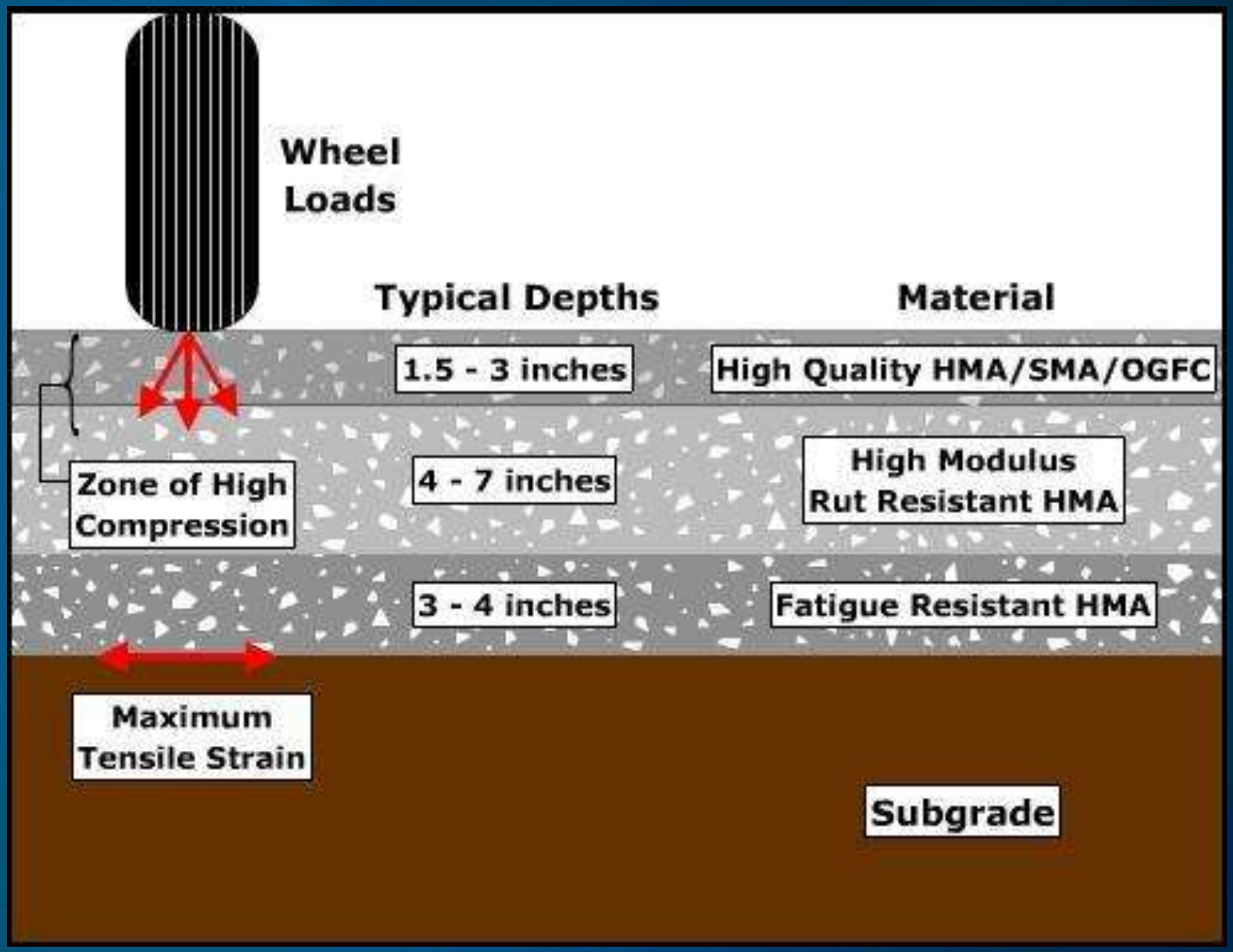


"Impacts of Wide-Based Tires on Pavement Performance" Webinar – Sept. 10, 2013

New Intersection Pavement Designs

- Static loads vs. Dynamic loads (is thickness adequate?)
- Fatigue resistant base layer
- Rutting resistant intermediate and surface layers

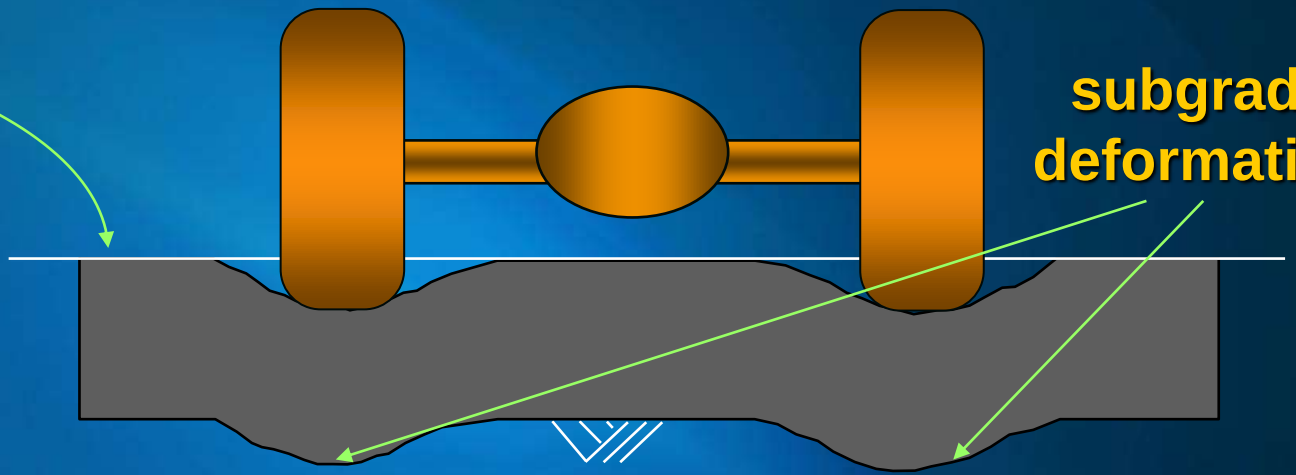
New Intersection Cross Section



Existing Intersection Pavements

- Are there existing distresses?
- How thick is the pavement?
- What is the condition/bonding of the existing layers?
- How thick would a new pavement be?

Types of Asphalt Rutting

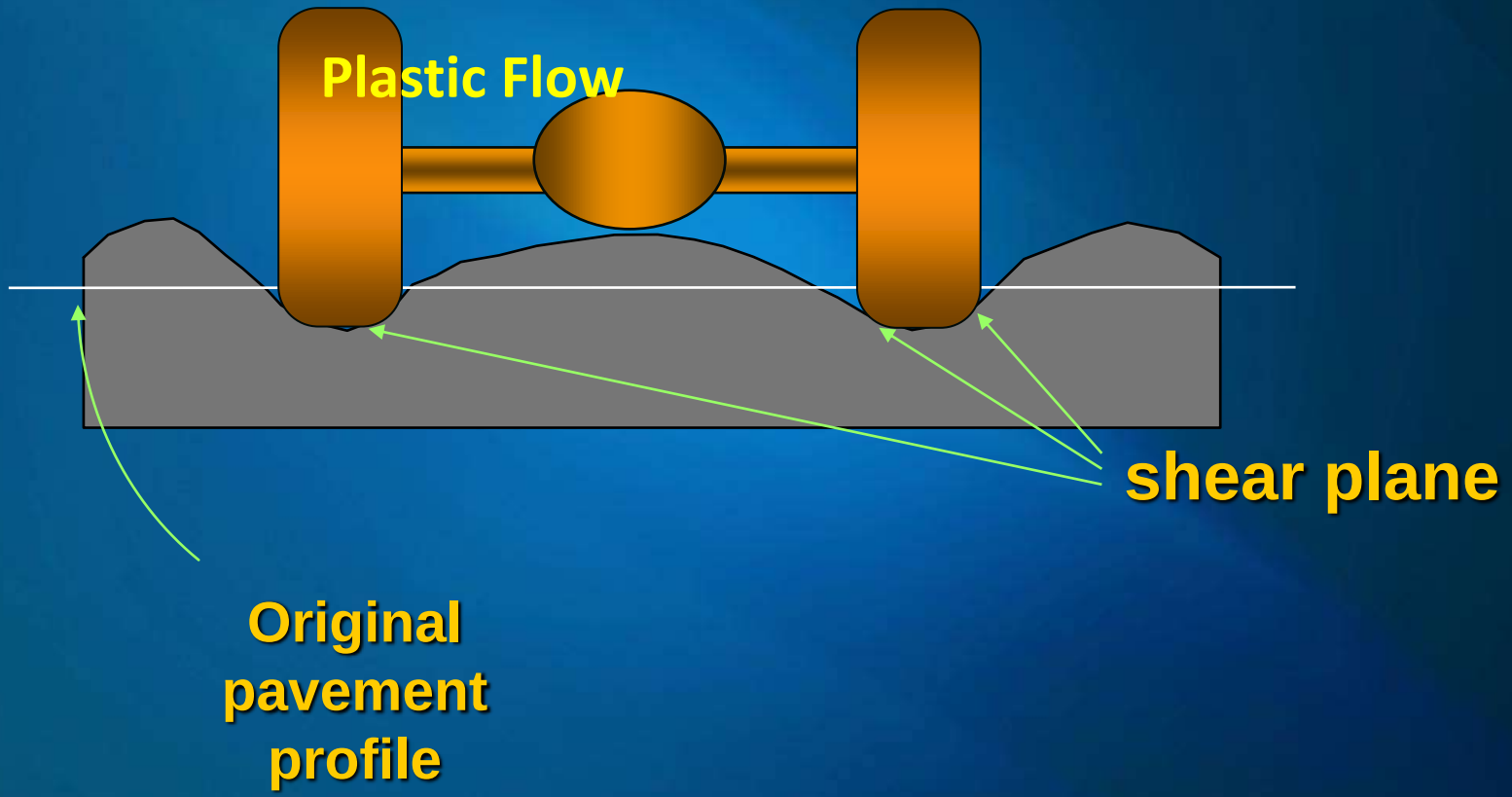


Mechanical Deformation
(not enough pavement structure)

Common Intersection Distresses

- Rutting
  - Subgrade, sub-base deformation (mechanical)
  - Asphalt layer(s) compaction/consolidation (densification)

Types of Asphalt Rutting



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- Rutting
  - Asphalt layer(s) plastic/shear flow

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How to Treat Existing Intersections

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  - Inadequate structure

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- First, determine the cause of the distress
  - Surface mix
  - Underlying layers
  - Inadequate structure
  - Loss of bonding (particularly near the surface)

How to Treat Existing Intersections

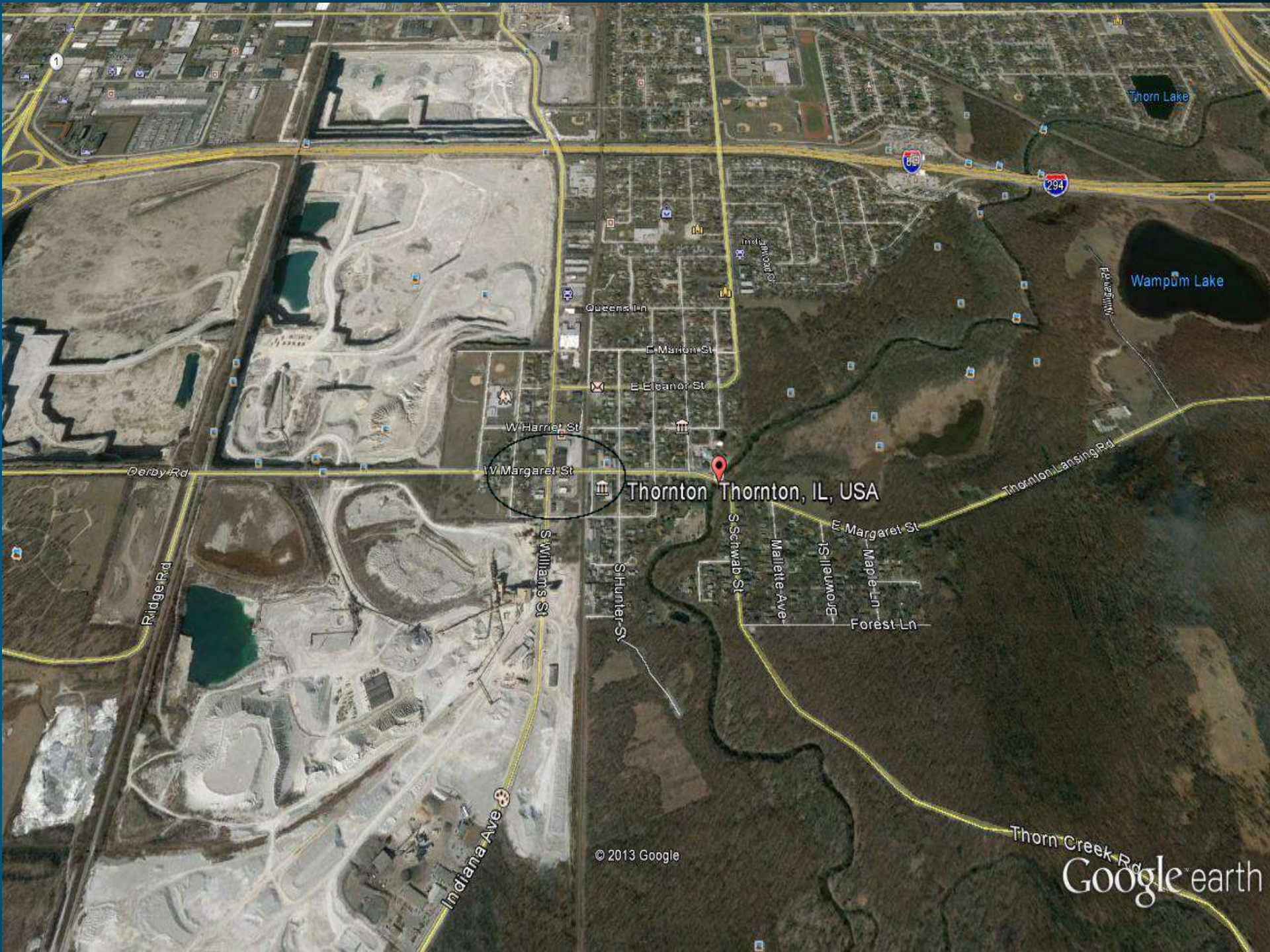
- Second, develop a treatment approach
  - How deep to mill (covering existing rutted or cracked surfaces makes the problem thicker)
  - Determine the length of the project
  - Select the proper AC mixture(s) and binder(s)
    - Consider lift thickness (SM-9.5, SM-12.5 or SMA)
    - Consider number of trucks (PG 70-22 or PG 76-22)

Can High Performance Asphalt Intersections be Built?

- Three case studies
  - Illinois
  - Kentucky
  - Maryland

Intersection Projects - Illinois

- Termed – “The World’s Strongest Intersection”
- Background
  - Located on a road serving world’s largest limestone quarry
  - In 2010, producing 50,000 tons of aggregate per day
  - 1,200 loaded trucks per day
  - Flexible pavement that had been rehabed numerous times


Thorn Lake
Wampum Lake
Queens Ln
E Marion St
E Eleanor St
W Harriet St
W Margaret St
Derby Rd
Thornton Thornton, IL, USA
Thornton Lansing Rd
E Margaret St
S Schwab St
Mallette Ave
Brownell St
Maple Ln
Forest Ln
S Hunter St
S Williams St
Ridge Rd
Indiana Ave
Thorn Creek Rd
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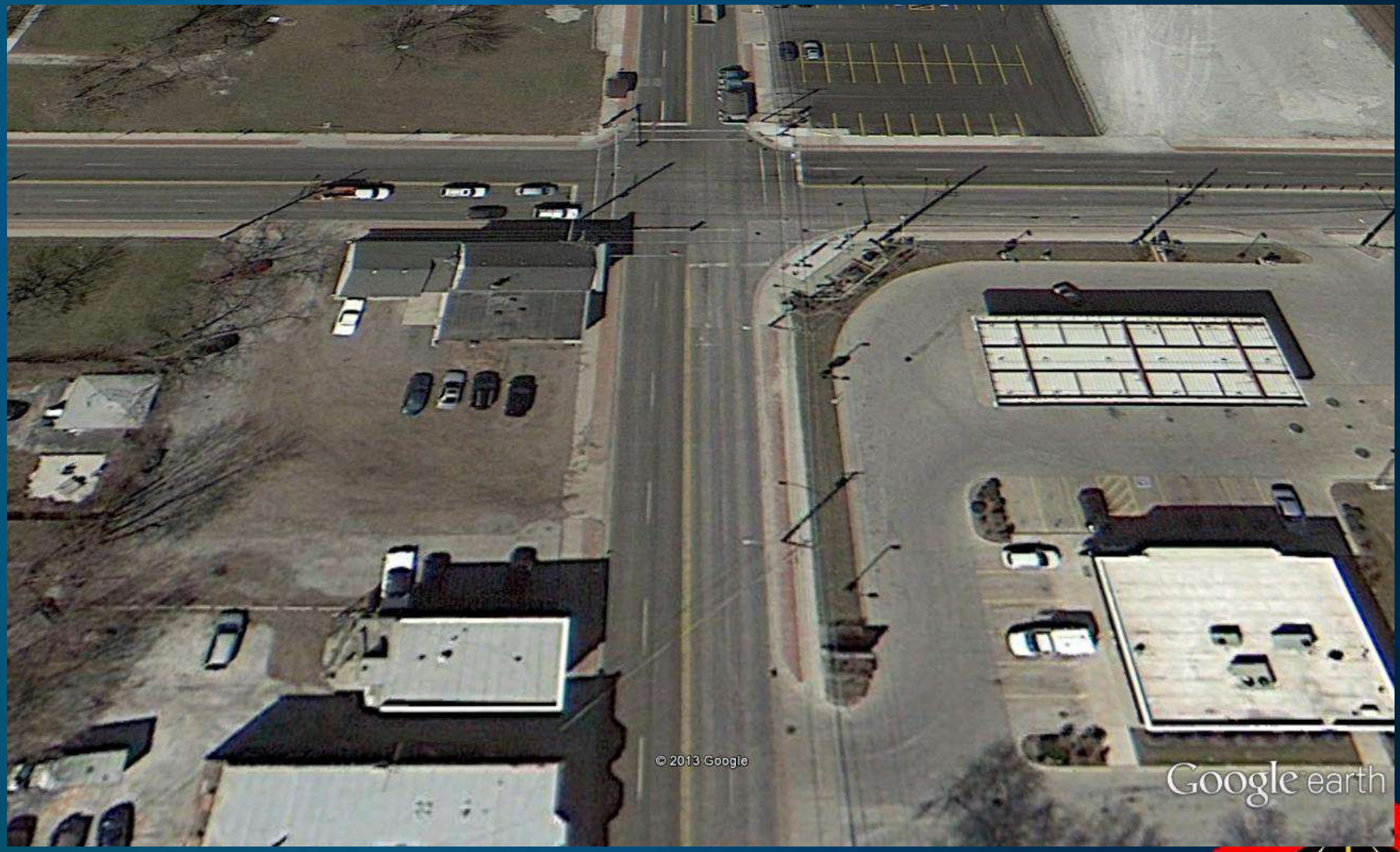
Intersection Projects - Illinois

- Solution
  - New approach tried in 1998
  - Cores showed deformation to a depth of six inches
  - Pavement was milled and replaced with a SMA intermediate layer and SMA surface layer using PG 76-22
  - As of 2010, almost 10 Million ESALs and virtually no maintenance

2013 Google Earth Image of Intersection



Intersection Projects - Kentucky

- Background
  - Intersections of US 27 and KY 80 with Cumberland Parkway required constant maintenance
  - KTC initiated a competition between each industry to repair a intersection
  - Asphalt chose SMA to replace the surface
- Outcome
  - By 2010, the SMA intersection was still in service
  - By 2007, the PCC intersection had been removed and replaced with SMA

Intersection Projects - Maryland

- Background
  - Evaluation started in 1994
  - Rutting Intersections on US 40 near Elkton, MD
  - Each industry challenged to design a fix
  - Existing pavement was 8” AC on PCC slab
- Solution
  - Asphalt industry recommended removal of entire AC layer based on cores and lab results
  - New AC layers utilized PG 76-22 with SBS; total depth was 8”
  - PCC industry decided to mill 6” and replace with 6” whitetopping

Intersection Projects - Maryland

Rt. 40 & Rt. 213 - Md Intersection Challenge Superpave shows proven durability. No maintenance since 1994.

PCC Intersection Replaced with AC

Rt. 40 & Landing Rd. - Md Intersection Challenge Superpave shows proven durability. No maintenance since 2000.

FACT or FICTION?

- Definitely a FACT
- Things to Keep In Mind
  - Slow and stopped loads are different than moving
  - Milling removes deteriorated layers and improves bonding
  - Mainline AC mixes may not work at intersections
  - If SUPERPAVE mixes being used, consider changing the binder near intersections
  - If SMA being used, ensure adequate quantity for cost purposes

Questions?